E C O T O X

ECOTOXicology Database System

TERRETOX Coding Guidelines

Prepared for

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C. TERRETOX CODING GUIDELINES

The TERRETOX Coding Guidelines presented below follow the format of the TERRETOX coding sheets located in Section 6. Supporting Materials . The TERRETOX Coding Sheet is divided into four sections: Quality Assurance Parameters, Test Information, Exposure Information, and Results Information. The field name associated with each test parameter, as presented on the TERRETOX Coding Sheet, is a topic heading. Below each heading is a detailed description of how to code data related to the specific test parameters. With few exceptions, reviewers should code the information as presented by the authors. Decisions regarding which information to code and how to represent the information in the database are based on the terrestrial plant and wildlife toxicity testing methods presented in ASTM and US EPA publications, as well as the scientific literature and toxicology textbooks. Test method publications used for the Terrestrial Plant and Wildlife Toxicity Effects (TERRETOX) database are listed in Section 6. Supporting Materials. Questions related to this document should be directed to the EPA Database Coordinator and the Lead Reviewer on the ADP Support Contract.

Note: Inclusion of publications into the TERRETOX database is determined by the test media used. If a terrestrial organism is exposed in an aqueous media, the paper will be placed into the AQUIRE database. Terrestrial nematodes are an example of an organism that may be coded either in TERRETOX or AQUIRE. If the test is conducted in soil media, then the data are coded in TERRETOX; if the nematode is isolated from soils and exposed using aquatic test methods, then the data are coded in AQUIRE. The exception to this rule is for hydroponic studies. Hydroponics is a terrestrial test method and is coded as such.

Note: Each publication included into the TERRETOX database must meet the five minimal criteria for acceptance (i.e. chemical, species, concentration, duration and effect) . If the paper is missing one or more of these criteria ECOTOX does not search other sources to obtain the missing data piece(s). Sources such as author communications and referencing another work to obtain one of the five criteria is allowed for specific risk assessment/criteria projects (e.g. EcoSSL or CAD) and must be specified by the EPA Database Coordinator.

Note: Only quantitative data are encoded into TERRETOX. If additional data are represented qualitatively (i.e., no numeric response values), the qualitative effects are noted in the general comments section. If the publication only reports qualitative data, the publication will be rejected.

Note: Lead shot papers are not encoded into TERRETOX. Authors often report the number of pellets fed to the animals, but not the actual dose of lead or concentration of lead/pellet. There are also instances in which the lead pellet is actually a mixture of two metals (i.e. Lead and tin).

Note: If a paper reports that the organisms used for measurements were dead and it is unknown how long the organisms have been dead this data is not encoded, but enter “dead organisms” in Other Effects. An author may measure the growth or weight of a dead organism. The weights of dead animals can be biased, especially for juveniles, depending on the time between death and measurement. Also, temperature may effect the measurement after death (e.g. higher brooder temperatures may cause rapid dessication which would result in weight changes).

Note: Studies involving carbon dioxide (CO2) or ozone (03) as the toxicant are not coded into the TERRETOX

database.

Method for Prioritizing Studies for Inclusion in the ECOTOX Database

- For published Criteria Documents (Final and Draft Final), all data that appear in the tables will be encoded into the ECOTOX database, without exception.
- For the TRV project, all papers identified appropriate for use in deriving the TRV (Scores >65), and having MOR, REP, or GRO data will be coded into ECOTOX, without exception.
- Data maintenance reported by users or EPA, will be addressed in a timely manner, without exception.
- For criteria chemicals, where the Office of Water has only published the reference list, for all OPP-ESA papers, and for all general ECOTOX coding, the following papers will be prioritized for coding:

    - Study must be published as either a journal article, thesis or numbered government report. Conference Proceedings, extended abstracts, and unpublished materials will be marked as such and removed from the coding queue.
    - Studies must be published in English. Non-English publications will be marked as such and removed from the coding queue.
    - Papers must report the use of a valid control. Studies that do not discuss the use of controls, or where the authors specifically state that a control was not used (ECOTOX codes NR and Z) will be marked as lacking a control ("No control" is placed in the Notes field (field 6) in Reference Manager) and will be removed from the coding queue.
    - The authors must report either a calculated endpoint, as defined by the ECOTOX coding guidelines, or presents statistically analyzed results. Papers presenting only qualitative data will be marked as such ("No endpoint, No stats" is placed in the Notes field (field 6) in Reference Manager) and removed from the coding queue.
    - Endpoint and/or statistical results must be summarized in either the text or tables. If results are only presented graphically or in figures, and specific concentrations (not ranged or approximate values) associated with the endpoint/statistical results are not presented, the paper is marked as having only graphed/figure data ("Graphed data only" is placed in the Notes field (field 6) in Reference Manager) , and removed from the coding queue.

1. Quality Assurance Parameters

Reference Number (#), Author, Year

Reference number is the unique number that identifies a particular publication. This number, automatically assigned by the data entry program, provides the link between data entered and the original publication. On the coding sheet, enter the reference number located in the upper right-hand corner of the hard copy of the publication, the last name of the first author, and the publication year in the data field REFERENCE #, AUTHOR, YEAR.

Total Tests

Total tests encoded for a publication are recorded by the reviewer in the TOTAL TESTS data field. The total test number equals the total number of results records coded in the RESULTS INFORMATION section of the coding sheet for each publication. Total tests are counted after the data abstraction process has been completed.

Reviewer/Review Date

The person conducting the data abstraction enters his/her last name in the REVIEWER data field. The date on which the publication was reviewed is entered in the REVIEW DATE field using the format of month/day/year.

QA Date/Name

Following data coding and prior to data entry, an ECOTOX staff member conducts a screening check of each coding sheet to ensure completeness and accuracy of data transcription. The person conducting this quality assurance screening check enters the date of the QA check in the QA DATE field, using the format of month/day/year, and their initials in the NAME data field.

Test Number (TID)

Each unique test is coded on a separate data sheet and assigned a unique test number (TID) by the reviewer. A unique test design may be characterized by a new test chemical, test species, test location, or exposure type. Additionally, there are experimental design (EDES) parameters that will influence a test scenario sufficiently to warrant an independent Test TID. Such parameters include tests conducted at different test temperatures or conducted during different seasons. Some examples are found in Tables 1 & 2.

Table 1: A study is conducted with 2 different chemicals and the exposure for 2 species is started at 3 different

lifestages. The Test IDs would be:

TEST ID	Unique Test Design
1	Benzene, Worm, Cocoon
2	Benzene, Worm, Juvenile
3	Benzene, Worm, Adult
4	Benzene, Bird, Egg
5	Benzene, Bird, Juvenile
6	Benzene, Bird, Adult
7	Toluene, Worm, Cocoon
8	Toluene, Worm, Juvenile
9	Toluene, Worm, Adult
10	Toluene, Bird, Egg
11	Toluene, Bird, Juvenile
12	Toluene, Bird, Adult

Table 2: A study is conducted with 1 chemical and the exposure for 1 species is conducted at 3 different temperatures. The Test IDs would be:

TEST ID	Unique Test Design	Exposure Info Remark
1	Benzene, Worm, 15C	EDES/Conducted at 15C//
2	Benzene, Worm, 20C	EDES/Conducted at 20C//
3	Benzene, Worm, 25C	EDES/Conducted at 25C//

If appropriate, include information about the Experimental Design parameters in the REMARKS data field for Species Information, Exposure Information or Soil Information as well as in the REMARKS data field for each independent Observed Response value reported.

2. Test Chemical Parameters

ECOTOX is catalogued by the toxicant tested using the Chemical Abstracts Service (CAS) registry number. If a CAS registry number is not available through standard sources the toxicity data cannot be included in ECOTOX. Additional toxicants not included in ECOTOX are water/soil chemistry effects (e.g., pH), complex effluents, and chemical mixtures.

Chemical mixtures may be interpreted broadly. For example, if a pesticide is a mixture of two active ingredients, each may have a separate CAS number. However, if the formulation of the two ingredients has a CAS number, the chemical reported for ECOTOX is the formulation. If the exposure is based on two metal compounds but the effect is based on one ion, e.g., copper sulfate and copper chloride and Cu is the toxicant, code copper as the test chemical and report the two compounds in chemical comments.

Another differentiation of a mixture is drawn when nutrients are added to an experimental set up. If the author states that a nutrient is added at a level that is needed for growth, ECOTOX does not consider this as a mixture. If, however, the author adds a series of nutrients and toxicants to test interactive effects, ECOTOX considers this a mixture. The following example illustrates how nutrients and toxicants are coded.

A. Effect of copper on plant growth

Nutrient Copper	20 ug/l	40 ug/l
0 ug/l	100%	120%
10 ug/l	100%	90%
20 ug/l	80%	80%
30 ug/l	60%	50%
40 ug/l	30%	20%

B. Effect of copper and nutrient on plant growth

Nutrient Copper	0 ug/l	10 ug/l	20 ug/l	30 ug/l	40 ug/l
0 ug/l	100%	100%	100%	110%	120%
10 ug/l	100%	100%	100%	100%	90%
20 ug/l	95%	90%	80%	85%	80%
30 ug/l	60%	60%	60%	65%	50%
40 ug/l	20%	15%	30%	35%	30%

A. Author states that nutrients are added for growth. All results coded. Each nutrient level is coded as a separate test and the nutrient level is noted in an experimental design set-up (EDES) comment.

B. Author does not state that nutrient is added for growth. Two tests are coded, one for the nutrient tested alone and a second result for the copper tested alone. The shaded area is not coded. Mixture is noted in general remarks.

If the author does not document the basal level value, a determination may be possible for deficient, basal and toxic dose levels. The suggested guideline for making this determination would be interpreting dose response results for mortality, growth and reproduction to determine the deficient, basal (or basal range) and toxic levels. This could be accomplished by interpreting the trends for these effects. The deficient results would be excluded and basal level are coded as the control. If multiple basal values are reported, the most optimal dose for mortality, growth, reproduction would be considered the control value.

If the toxicant added does not produce a toxicity test result (i.e., only deficient and/or basal levels), then the paper would be rejected as nutrient study.

For *in situ* exposures where the exposure is by default an exposure to a chemical mixture; code residue measurements or endpoints (BCF) only. No other effects or endpoints are strictly attributable to a single chemical in the same way as a residue concentration. Data for chemicals in the mixture with reported media concentrations and residue effects should be coded.

A standardized identification number and name for each chemical is recorded in the database to ensure quality and consistency. Toxicants, carriers and positive control chemicals reported in ECOTOX are assigned a Chemical Abstract Services (CAS) Registry number and are referred to by the Collective Index (CI) standard nomenclature. The CAS number and CI name are stored in a chemical card file and an online index file (EcoChem). EcoChem is available for screening CAS numbers and chemical names used in ECOTOX. Chemical name synonyms are stored electronically, but are also available from the chemical card file.

Test/CAS Number/Chemical Name/

Record the test, carrier and/or positive control chemical name as it is reported in the publication. The test chemical, as presented by the author, is reported on line number one (TEST). The CAS number is assigned by locating the chemical name in the ECOTOX chemical card file. If the chemical name is not in the chemical card file, record a ‘no’ in the CAS number field and the coding sheet will be referred to ECOTOX staff for CAS number verification following completion of the coding and screening quality assurance checks.

For the remaining chemical information lines, record the chemical name as reported by the author regarding any carriers, solvents or positive controls used for the test. If neither a carrier/solvent nor a positive control was used, report as 'NR'. If a carrier/solvent or positive control was used, circle “Carrier” or “Positive Control” as applicable. Frequently used carrier/solvent CAS numbers are listed in Appendix A. The CAS numbers for positive control chemicals are assigned by locating the chemical name in the ECOTOX chemical on-line or card file. If the chemical name is not in the chemical card file, record a ‘no’ in the CAS number field and the coding sheet will be referred to ECOTOX staff for CAS number verification following completion of the coding and screening quality assurance checks.

Note: Water should not be coded as a solvent. A solvent is defined as an agent (other than water) in which the test chemical is mixed to make it miscible with dilution water before distribution to test chambers. Solvents or carriers are used in toxicity tests where the concentrations of the test chemical are extremely low and a very small amount of test material must be added to the test chambers. (Rand, 1995)

Note: Exposure and observation data for carrier and positive control chemicals are reported in the Exposure and Results sections. Refer to these sections for specific instructions.

Chemical Grade

Record the chemical grade information for each chemical reported in the GRADE data field (refer to Appendix B for the applicable codes).

Chemical Purity

Record the numeric percentage information about the purity or active ingredient of the chemical in the PURITY data field (e.g., if the author reports 97% purity, 97 would be entered into this data field. PU for purity would be entered into the FORMULATION data field (see CHEMICAL FORMULATION).

Chemical Formulation

Record the chemical formulation code for each chemical reported in the FORMULATION data field (refer to Appendix C for the applicable codes).

Chemical Comment

Supplemental information about the test chemical is entered into the CHEMICAL COMMENT field. If a mixture of labeled and unlabeled chemical is used, remark “labeled and unlabeled” in this field. Record additional relevant chemical information such as trade names, common names, or isomers in this field.

Radiolabel

If a radiolabeled chemical is tested, record the isotope in the RADIOLABEL field (see Appendix D for codes). When the specific isotope is not reported or when multiple isotopes are reported, the field is marked with an asterisk (*). In REMARKS, note either RADIO/no isotope reported// or RADIO/isotope xx and isotope yy//. When both radiolabeled and unlabeled test chemicals are used in a test, report the radiolabeled isotope and code “labeled and unlabeled” in the CHEMICAL COMMENT field.

Note: Any REMARKS made for fields in this section will be recorded according to the instructions set forth in Test Information.

Chemical Abstracts Services Registry Number (CAS NUMBER)

The CAS Number of the toxicant is recorded in the CAS NUMBER field. A standardized identification number and name for each chemical recorded in the database is used for consistency. Toxicants included in the ECOTOX database are assigned a CAS registry number and are referred to by the Ninth Collective Index (CI) standard nomenclature. The CAS number and CI name are stored in a chemical card file and in an online index file (ECOCHEM) which is available electronically for screening CAS numbers and chemical names used in ECOTOX. If a hydrated form of a chemical is used in the paper, record the hydrated form as reported by the author in the TEST field. However, record the CAS Number for the non-hydrated form of the chemical in the CAS NUMBER field.

3. Test Information

This section is used to report general information describing the test scenario. If any of the following information changes, a new Test ID is assigned and a new coding sheet is required. Specifically, the Test Information section describes the test organism, the test location and exposure type, information about the type of controls used, the total number of doses, and the application frequency. Refer to Table 3 for coding examples.

A. Test Organism Information Parameters

Species Number/ Scientific/Common Name

The test organism is identified by the current scientific name as verified in the taxonomic literature. Enter the species name, as presented by the author in the SPECIES SCIENTIFIC/COMMON NAME field. Each unique test organism is assigned a species number which is stored in the CRITTERS database. Locate the number for the species in the CRITTERS database and enter it in the SPECIES NUMBER field. If the species is not in the CRITTERS database enter 'no' in the SPECIES NUMBER field, and the coding sheet will be referred to ECOTOX staff for species verification following completion of the coding and screening quality assurance checks. For each species number, the verified name, taxonomic hierarchy, nomenclature history, and verification sources are kept on file for quality assurance documentation.

Generally, when coding effects in ECOTOX, the data are reported for each individual species. Field studies may report results for a target community (e.g., beneficial and non-beneficial

insects) or for an entire enclosed ecosystem (e.g. system-level primary productivity or respiration). Assign a community to the most specific taxonomic level possible (e. g. “earthworms” would be classified as “Oligochaeta,” “weedy plant species” would be classified as “Magnoliophyta.”). If you are not sure about the classification of a community, enter ‘no’ in the SPECIES NUMBER field, and it will be sent to ECOTOX staff for verification.

Decisions regarding the inclusion of species in TERRETOX are based on published terrestrial ecotoxicology standard methods and procedures documentation (eg., Menzer et al 1994; US EPA testing series; ASTM testing series). The focus for TERRETOX is to collect publications with data for soil invertebrate and microbial species, plant species (agricultural and native), wildlife avian species (e.g. mallard, pheasant or bobwhite), wild mammalian species (e.g., meadow vole, deer mouse or mink), terrestrial lifestages of amphibians and reptiles, and beneficial invertebrate species (e.g., honey bee, leafcutter bee or alkali bee). If data for other species including laboratory, domestic or non-beneficial organisms are reported in a publication, data for all test species are coded for entry into TERRETOX. Publications focusing primarily, or solely, on laboratory, domestic or non-beneficial organisms are not actively acquired or coded at this time.

Organism Source

Report the source of the test organism in the ORGANISM SOURCE data field (see Appendix E for codes). The source explicitly includes the strain of the organism, e.g. laboratory strain versus wild strain.

Organism Lifestage/Age

The LIFESTAGE/AGE data field records the specific lifestage and/or age for each test organism at beginning of exposure, as reported in the paper (see Appendix F for lifestage codes and Appendix I for time units associated with the age of the organism). Record the lifestage information in the first box and age information in the second box on the coding sheet. Record as 'NR' if the information is not reported in the publication.

Organism Comment (Org Characteristics)

Report any general information provided about the test organism. Characteristics may include information such as specific strain name, cultivar, variety, weight, length, developmental stage, hybrids or taxonomic groupings used to describe the organism being tested.

Note: Information regarding the sex of the test organism is coded in the Sex field, see Exposure Information. The

sex of the organism is often directly linked to the exposure and subsequent response observations; for example, specific reproductive responses are unique to males or females.

Note: When reporting a cultivar, include 'cv.' before the name of the cultivar. Include 'var.' for variety in a similar manner.

Table 3. Test Information Coding Sheet Example

SPECIES SCIENTIFIC/COMMON NAME __Aphis sp._____			**ORGANISM INFORMATION**
SPECIES NUMBER	5519		
ORGANISM SOURCE	WLD		
LIFESTAGE/AGE	NR	1-2 d	
CHARACTERISTICS	*A. mellifera* and *A. ligustica*		
TEST LOCATION	LAB		**EXPOSURE INFORMATION**
EXPOSURE TYPE	FD		plants sprayed outdoors in evening; moved to lab next day; bees exposed to plants in lab
EXPOSURE DURATION	6 D		
STUDY DURATION	2 WK		
CONTROL TYPE	B		
NUMBER OF DOSES	3		
APPLICATION FREQUENCY	ADL		
MEDIA TYPE	NAT		**SOIL INFORMATION**
SOIL TYPE	Pedozioic Clay -silt		
SOIL TEXTURE %	**SA** 79 **SI** 15 **CL** 6		
MEDIA PH	5.6		
MEDIA ORGANIC MATTER	5 %		
MEDIAMOISTURE (%)	31		
MEDIA CEC	NR		
SOIL CONC MEASURED)/ DRY-WET WEIGHT	M	DRY	

B. Exposure Information Parameters

Test Location

Report the location or setting in which the experiment was conducted in the TEST LOCATION data field (see Appendix H). For example, a natural field study (FieldN) is an experiment conducted outdoors in a natural setting. The test organisms are sampled in the wild, e.g. population counts. Outdoor studies conducted in a simulated environment are coded as an artificial field study (FieldA). Artificial field studies include organisms isolated from their natural environment via an enclosure of some type, e.g. cages or fencing. If the publication does not provide enough information to distinguish between FieldA and FieldN, then use the code FieldU to indicate that the field test type is unknown. Laboratory tests (LAB) are conducted indoors under controlled laboratory conditions. If the location or setting cannot be identified as laboratory or field from the publication, code as Not Reported (NR).

Exposure Type

For the TERRETOX database, the term 'exposure' is used to refer to the mechanism by which the toxicant was applied. Organisms are typically exposed to toxicants through diet, injection, inhalation, topical or environmental routes. On occasion, an exposure may be through multiple routes (e.g., such as topical and oral).

Some exposures could be coded a variety of ways. For example, exposure as an aerial spray to a field plot could be coded either as a spray application or as exposure through multiple routes, eg. topical (through skin) and diet (from consumption of exposed vegetation) for animals, or topical (through leaves) and environmental (root uptake) for plants. Within the TERRETOX database, this instance is coded as a spray application. Multiple exposure route coding is applicable when the organism is exposed through two *independent* applications, for example, a contaminated diet *and* toxicant inhalation for animals or contaminated soil *and* leaf spray for plants. In this scenario, 'MU' would be entered into the EXPOSURE TYPE data field and a remark (TYPE/'FD' and 'IH'// or TYPE/'PR' and 'FS'//) would be noted in the Exposure Info comments section.

TERRETOX does not include in vitro assays [i.e. an experimental trial, involving biological matter, which is exposed to a toxicant in an artificial apparatus rather than within a living organism] in the database. Studies in which the living organism is exposed as a whole, but an effect on an internal process is examined outside the body after the exposure, are coded (e.g. enzyme functions). The database contains some studies using excised organs and cell cultures from plants, however these types of studies are not actively coded at this time. Future coding of these studies is under discussion.

When coding, report the specific exposure type, e. g., for an intercutaneous injection, code as IC (intercutaneous) not I (injection). For an environmental exposure, code as HS (hand spray) not V (environmental). If an exposure type is not reported, code as Not Reported (NR). Refer to

Appendix J for exposure type codes.

Control Type

Effects of toxicant exposure are evaluated by comparing the exposed organisms to untreated organisms - the controls. All toxicity tests should include a concurrent control where the test conditions are identical except for the absence of the toxicant. Some toxicity tests will also include a control for other test conditions such as the use of a solvent, feeding or acclimation requirements, historical or pre-exposure conditions and for establishing reproducibility by use of a reference toxicant. (Doull et.al. 1980)

Report the type of test control(s) used in the study (Appendix M) by recording the applicable code in the CONTROL TYPE field. If more than one type of control is used in the study, e.g., a dilution water and carrier control, code 'M' for multiple controls. Often comparisons are made that do not meet the criteria for a control; these types of comparisons include starvation studies and acclimation periods. Report the studies that complement the toxicity test, e.g. a starvation study used in a feeding behavior or avoidance test, as a comment in the REMARKS data field in the Test Information section of the coding sheet. Sometimes a paper will report a table of baseline or historical control values. Do not code these values unless there is a direct correlation to a measurement or endpoint; code only control values which complement response values.

When data for the control are reported only in graphical format, interpret the data as accurately as possible and remark that the control data were obtained from a graph in the results information section. Data points derived from a graph are most typically represented as an approximation of the data point, a range around the specific data point or as a range for all of the represented values.

If a control is identified for the test but no exposure or results data are reported, record the appropriate control type code in the Control Type field. No data will be coded in Exposure or Result Information fields.

Number of Doses

Report the total number of exposure doses, including the controls, for each independent test design in the NUMBER OF DOSES data field. If number of exposures is not reported, e.g. in a publication reporting only calculated endpoints such as LD50s, code the field as 'NR'. Do not include endpoint or ranged doses or number of replicates in the total number of doses.

Application Frequency

Report the frequency of the dose application in the APPLICATION FREQUENCY data field. Refer to Appendix K for application frequency codes and units.

Exposure and Study Durations

A toxicity test may range in duration from a pre-treatment period through the actual toxicant exposure and conclude with observations of the organisms post-exposure. Duration information is coded using the units reported in the publication (see Appendix I for valid units). Refer to Table 4 for a coding example. Exposure and study durations are reported with the Test Information. Observation Duration is reported with the Results Information.

Table 4. Example 17-day experimental period with 2-day pre-treatment, 5-day exposure, and 10-day observation. Note: Pre-treatment days are not included in the study duration.

	DURATION OF EXPERIMENT																
	Pre-Trt		Exposure					Observation									
Calendar Days	1	2	3	4	5	6	7	8	9	10	11*	12	13	14	15	16	17
Test Periods	1	2	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10
Reported Days (Study Duration)	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Note: In test scenarios where incubation times are reported, i.e. enzyme fixation assays, be careful to report the toxicant exposure time *not* the assay incubation time.

Exposure Duration

The exposure duration is a mandatory field for inclusion in the TERRETOX database. In cases where the observation time is the only duration reported, it is assumed that the exposure duration is equivalent to the observation time. If the exposure duration is not reported, the paper is rejected. The period of time recorded in the EXPOSURE DURATION data field is the time of actual exposure to the chemical. For example, in Table 4 the exposure duration equals 5D.

In some cases a biological time is used, such as an exposure time reported as “until hatch”, “growing season” or “after the nth egg has been laid”. Use the code from Appendix I that best describes the author's words in duration units data field. ‘NA’ will be coded as the duration mean value for all biological time durations (e.g. EXPOSURE MEAN: NA, EXPOSURE UNIT: HT; corresponds to an until hatch duration), unless a numeric value is substituted (e.g. EXPOSURE

MEAN: 2, EXPOSURE DOSE: HV; corresponds to a 2 harvests duration). However, references to time such as “observed at end of the study period” are not coded; such papers are rejected as having no exposure duration.

For injection, diet, topical and environmental exposures where the actual exposure is dependent on biological and environmental conditions, the exposure time is recorded as equivalent to the study time. This assumption is made to ensure consistency in data representation; it is not necessarily a true reflection of the exposure time.

Study Duration

The study duration is the total time of the study *excluding* pre-treatment times. In the example in Table 4, the study duration is equal to 15D (5D exposure plus a 10D observation). In cases where the observation time is the only duration reported, it is assumed that the study duration is equivalent to the observation time. The study duration will be reported as 'NR' if no observation or study time is reported.

Note: for most field studies the exposure and study duration are identical because it is difficult to determine when the exposure ends. It is difficult to know when the application has completely dissipated in the environment. For lab studies the exposure and study duration may be different. This difference will be seen when there is a recovery period from exposure duration. For lab studies when the treatment is some type of injection or diet (intraperitoneally or by gavage), study duration and exposure duration are the same.

Media Type

Report the type of exposure media, (e.g., natural or artificial soil, aqueous (hydroponic), filter paper), in the EXPOSURE MEDIA data field using codes presented in Appendix L. Report as 'NR' if you cannot determine the exposure media from the paper. If an aqueous exposure is conducted in pore water from a specific soil, report the soil parameters in the soil characteristics fields (pH, CEC, OM, etc.). If the bottom of the experimental chamber is covered with sand and then topped with filter paper, an Experimental Design (EDES) remark should be made that sand was used in the chamber, but MEDIA should be FLT.

C. Media Information Parameters

Soil Type

Report the scientific name of the natural soil or commercial name of the artificial soil used in the study in the SOIL TYPE data field. If the scientific name is not included report the type of soil using the author's terminology, eg., forest soil, sandy loam soil, arboreal coniferous soil.

Soil Texture (Sand, Silt and Clay)

Report the texture of the soil as stated by the authors in the SOIL TEXTURE data field using percentages of sand (SA), silt (SI) or clay (CL).

Note: Clay may be reported as bentonite, kaolinite or montmorillonite.

Media pH

Report the pH of the test media used in the MEDIA pH data field. If the pH of the treated media is not presented, but the pH value is stated for the untreated or acclimation media, code the untreated media pH and add an asterisk to the end of the value. If the author specifies a measurement method for the pH value (e.g.,that the pH value is measured by pHKCl or pHCaCl2), code the pH value and identify the measurement method in the REMARKS field. If the authors report that a standard (see Attachment G for list of standard soils) or commercially available artificial soil is used, but do not present pH, use the pH reported in the standard test method referenced by the author. If pH is reported for the untreated or acclimation media, code this pH value in the same way as outlined previously and denote with an asterisk. If the pH of a specific soil type is not given in the publication, a search of the USDA/NRCS National Cooperative Soil Survey (USA) online site, at the following web address: http://www.statlab.iastate.edu/cgi-bin/osd/osdname.cgi or the United States Department of Agriculture's Natural Resources Conservation Service National Soil Survey Center site at the following web address: http://vmhost.cdp.state.ne.us:96 can be conducted for the specific soil series. If the pH is found, range the pH values for all soil depths in the pH data field and remark in the comments section pH/from USDA web source//. Attach a printout of the pH information from this site to the publication.

Media Organic Matter Type and Units

Report information about the test media organic matter as presented by the author. Use the measurement value, organic matter type, and units reported by the author. Refer to Appendix FF for organic matter type codes and units. If carbon and/or nitrogen content of the soils are reported, record these values in the Soil Information Remarks section; organic matter content may be estimated from these values. If the authors report that a standard (see Attachment G for list of standard soils) or commercially available artificial soil is used, but do not present organic matter content, use the organic matter content reported in the standard test method referenced by the author. If organic matter is reported for the untreated or acclimation media, code this organic matter value in the same way as outlined previously and denote with an asterisk. If the organic matter of a specific soil type is not given in the publication, a search of the USDA/NRCS

National Cooperative Soil Survey (USA) online site, at the following web address: http://www.statlab.iastate.edu/cgi-bin/osd/osdname.cgi or the United States Department of Agriculture's Natural Resources Conservation Service National Soil Survey Center site at the following web address: http://vmhost.cdp.state.ne.us:96 can be conducted for the specific soil series. If the organic matter is found, range the organic matter values for all soil depths in the OM data field and remark in the comments section OM/from USDA web source. Attach a printout of the organic matter information from this site to the publication.

Media Moisture

Report percentage of moisture in the test media in the MEDIA MOISTURE data field. If moisture is reported for the untreated or acclimation media, code this moisture percentage and denote it with an asterisk.

Media Cation Exchange Capacity (CEC)

Report cation exchange capacity and units (Refer to Appendix FF for organic matter type units) of the test media in the MEDIA CEC data field. If the cation exchange capacity is reported for the untreated or acclimation media, code this value and denote with an asterisk.

Soil Concentration (CONC) Measured / Dry-Wet Weight

If soil was the exposure media, use the first data field to report if the toxicant concentration was measured in the soil. If measured, code as 'M' in the SOIL CONC MEASURED data field. If not measured or no information is provided, code as 'U' or 'NR' respectively in the SOIL CONC MEASURED data field.

For instances where some treatment levels are measured and some are unmeasured/nominal, denote the SOIL CONC MEASURED as 'X,' signifying that a mixture of measured and unmeasured values was reported in the publication, but ECOTOX reports the nominal concentrations.

Soil Concentration (CONC) Basis of Measurement: Dry/Wet Weight

Record whether soil concentration was reported based on dry or wet weight in the DRY - WET

WEIGHT data field.

Media Comment

Test Information REMARKS sections are used to include additional information necessary for interpreting any of the specific test information fields as well as for providing information concerning the test in general. When additional information is necessary for a given field write 'FIELD NAME/remark text//' (refer to Appendix EE for applicable field name abbreviations). For general information that is not associated with a specific field, label the Remark as Other Effects (OEF). The Experimental Design (EDES) notation is used to identify information that differentiates between exposure scenarios but does not directly implement changes in the data fields. Information that may make a significant change in test design includes varying exposure substrates or seasonal exposure scenarios.

4. Exposure Information

This section is used to record the exposure parameters for each specific test. A specific test is identified by the Test ID (TID) number as previously described. Within each specific test, information is recorded for every treatment level including test controls, positive controls, carrier controls, and toxicant exposures. Such information includes the sample number and sex, the exposure dose, whether the dose is reported in ionic form, the chemical analysis method, and any pertinent remarks (see Table 5).

Dose ID and Dose Number (No.)

Each treatment in a test is assigned a Dose ID and a Dose Number. Controls are always reported first and identified by the appropriate letter code from Appendix M in the DOSE ID field. Exposure doses are identified by the letter 'D'. A link is created to calculated endpoints that are dependent on multiple exposure doses by coding a line identified by the letter 'E' (the linkage 'E' is not used for BAF, TKNO or LTxx/Etxx data. These are linked to a specific dose). Information taken from a graph (responses that DO NOT have endpoints or statistics) may be coded using a ranged dose 'R' that encompasses all of the exposure concentrations excluding the control(s). If more than one type of control is used in the study, e.g. a dilution water and carrier control, code two lines for control, ('C' for the dilution water control and 'V' for the carrier control) in the DOSE ID field. If more than one control of a specific type is used, number each

control in the set as a replicate, e.g. 1V,. 2V If a control or treatment is identified for the test but no exposure data are reported, there will not be any data to code for Exposure Information or Result Information. See Tables 3, 4 and 5 for coding examples.

When replicates are used *and* the results are reported separately for each replicate, code a separate line for each replicate. When the publication notes that replicates were run but the author *only* reports the results as the mean of the replicate values, do not code individual lines for the replicates but instead note this information in General Remarks, ie. “x replicates;’‘ see also the Observed Response Value section in Results Information for additional instructions.

When dose data are reported only in a graphical format, interpret the data as accurately as possible and remark that the data were obtained from a graph. Data points derived from a graph are most typically represented as an approximation of the data point, a range around the specific data point or as a range for all of the represented values.

Note: For the example in Table 5 , the Number of Doses reported in Test Information would be six (6) to represent the two control levels and four treatment levels; all doses tested are recorded in this field regardless of whether responses are reported. Endpoint (E) and range (R) "doses" and replicate concentrations DO NOT get counted in the total number of doses.

Table 5. Exposure Information

Dose No	Dose ID	N	Sex	DOSE	sm	Value	Unit	ion	M/U	RN
1	C	10	F	0	-	-	ppm	-	U	
2	C	“	“	“	-	-	“	-	“	NR
3	V	“	“	1	-	-	ug/l	-	M	
4	D	“	“	3	SE	0.01	ppm	Cu	“	2
5	D	“	“	“	“	0.15	“	“	“	
6	D	“	“	9	“	0.02	“	“	“	“
7	D	“	“	“	“	0.15	“	“	“	
8	E	NR	“	NR	NR	NR	NR	“	“	NR

DOSE NO	DOSE ID	N	SEX	DOSE	SM	VALUE	UNIT	ION	M/U	RN
GENERAL REMARKS 1. CNTRL/Control for first generation only// 2. DOSE/Conc reported as flower residues//										
DATA CONTINUES ON NEXT PAGE										

Note: On occasion, when coding data for the Exposure Information section, the number of test exposures and/or replicates will exceed the allotted coding space. If this should occur, continue coding on a second sheet. Note at the bottom of the exposure information section on the first page that the data continues on a second page.

Note: When concentrations are not reported for soil and pore water doses, but endpoints are reported, code exposure information as 'E-dose# = NR', then code two separate endpoints for the soil and pore water endpoints in the results section. Add a remark RVALUE/soil conc// or RVALUE/pore water conc// respectively.

Sample Number (N)

Sample number, denoted by an 'N' on the coding sheet, reflects the sample size at each exposure dose, i.e., the number of test organisms per treatment. Code as 'NR' if not reported.

Gender (Sex)

This field identifies the sex of the organism (male (M), female (F) or both (B) at each exposure level. The importance of this field becomes apparent where organisms of both sexes are exposed at a given treatment level, but the observations are conducted on either the male or female. In this instance, the SEX field would be coded as B in Exposure Information, with individual results reported for M and F in Results Information in the Sample Number Unit field. See Results Information and Table 5 for coding examples. Code **'NR'** if not reported.

Dose

Report the exposure dose as reported in the publication. Report the approximation (~), minus (-), greater than (>), or less than (<) symbols used by the author(s) to describe the exposure dose. The mean and/or range is coded in the DOSE data field and the unit in the UNIT field, see below.

If the range values are confidence interval (CI), confidence limits (CL) or fiducial interval (FI) code the abbreviation in the SM data field. See the coding example presented in Table 5 .

For instances where some treatment (dose) levels are measured and some are unmeasured/nominal, and all unmeasured/nominal concentrations are reported, report the ummeasured/nominal concentrations for each treatment level so that the range of concentrations is consistent and monotonical. Denote all of the concentration analysis methods as 'X,' signifying that a mixture of measured and unmeasured values was reported.

Note: If chemical concentrations (especially metals) are reported in terms of Total, Exchangeable, Water Soluble and Pore Water concentrations, Total is the concentration selected for entry into the dose data field. The other concentrations are reported as remarks.

Note: If a background concentration is reported for the chemical being applied, report the background value in the control dose in the DOSE field.

Dose Statistical Method (SM)

Report the method used to determine the range around the Dose in the SM data field, if reported by the author(s). Use standard codes for the methods, i.e., standard deviation (SD), standard error (SE), confidence interval (CI), confidence limits (CL) or fiducial interval (FI) or range (R). If the interval around a value is not identified in the paper as SD, SE, CI, CL, FI or R, then code as not reported (NR).

Dose Value

Report the numeric value of the standard deviation or standard error around the Dose in the VALUE data field, as reported by the author(s).

Dose Unit

Report the measurement unit that corresponds to Dose in the UNIT data field (see Appendix N for standard units).

Ionic Fraction

For ionizing substances (e.g., metals, ammonia), report the dose as the ion if the concentration presented by the authors is reported as based on the ionic form of the compound (e.g., organotin as Sn). Code the appropriate ionic symbol in the ION data field (see Appendix O for ion codes). If concentration is based on the total compound, code 'NR' in this field. For non-ionizing substances, code 'NR' in this field.

Chemical Analysis Method (M/U)

The M/U data field identifies whether nominal or quantified exposure dose values were reported by the author(s). For the specific exposure level, report whether toxicant and/or carrier concentration was measured (M) or calculated/nominal/unmeasured (U) (see Appendix P for codes and definitions). When it is not clear whether reported concentrations are measured, calculated or unmeasured, record as Not Reported (NR).

For instances where some treatment (dose) levels are measured and some are unmeasured/nominal, and all unmeasured/nominal concentrations are reported, report the unmeasured/nominal concentrations for each treatment level so that the range of concentrations is consistent and monotonical. Denote all of the concentration analysis methods as 'X,' signifying that a mixture of measured and unmeasured values was reported.

Remark Number/Remarks (RN)

When there are remarks for a specific test, the REMARKS field as well as the Remark Number RN (remarks number) data field, will be coded. Remarks are identified by the coding field abbreviation listed in Appendix EE. The Remark Number (RN) field is used to link the remarks associated with each specific test. Each unique Remark is assigned a Remark Number, and only one Remark Number is used per result entry. Use an independent unique Remark Number for each section of the database, i.e., do not carry over Remarks or Remark Numbers from the Exposure section to the Results section. Refer to Tables 3 and 5 for coding examples.

General Comment

General information about the exposure such as any specific methodology or techniques used is recorded in the REMARKS data field with the Other Effect (OEF) identifier. General information about the test may include names of other chemicals that were tested but were not coded for TERRETOX, results are not provided, effects that have been reported but are not linked to a

dose, effects that are reported but are not applicable to TERRETOX (e.g. in vitro studies, selectivity ratios, acute to chronic ratios), or effect modifiers such as changes in soil pH, temperature or humidity.

5. Results Information

This section is used to record observed effects for each control and dose level reported for the specific test. The Dose ID and Dose No. is carried forward from Exposure Information. Information specific to the observed response includes the sample number and sample unit, exposure duration, descriptors of the effect observed, the response site, and a quantitative measure of the response. Refer to Table 6 for specific fields included in this section of the TERRETOX Coding Sheet.

General Information on Results Coding:

Coding Data Similarly Presented

Often data are reported as individual measurements as well as a mean or range for these values. Report individual test results only. However, if both raw data and percentages, e.g. number survived and % survival, are reported, both values are coded. An exception to this coding procedure occurs when data reported for individual endpoints are graphed and mean/median data are explicitly reported. For example, when replicate LC50s are reported on graphs and the mean and median LC50s are reported in the text, code both the graphed and textual data (remark on data points taken from the graph, and also note mean LC50 or Median LC50 in the comments).

Graphed Data

Data points derived from a graph are represented in TERRETOX as an approximate value, a range around the specific data point or as a range for all of the represented values. The values taken from the graph must be ranged using the author' s X- and Y- axis values. Do not interpolate values that lie between axis values. A result remark is added to the observed response field denoting that the data were extracted from a graph.

Graphed data are coding one of the following ways:

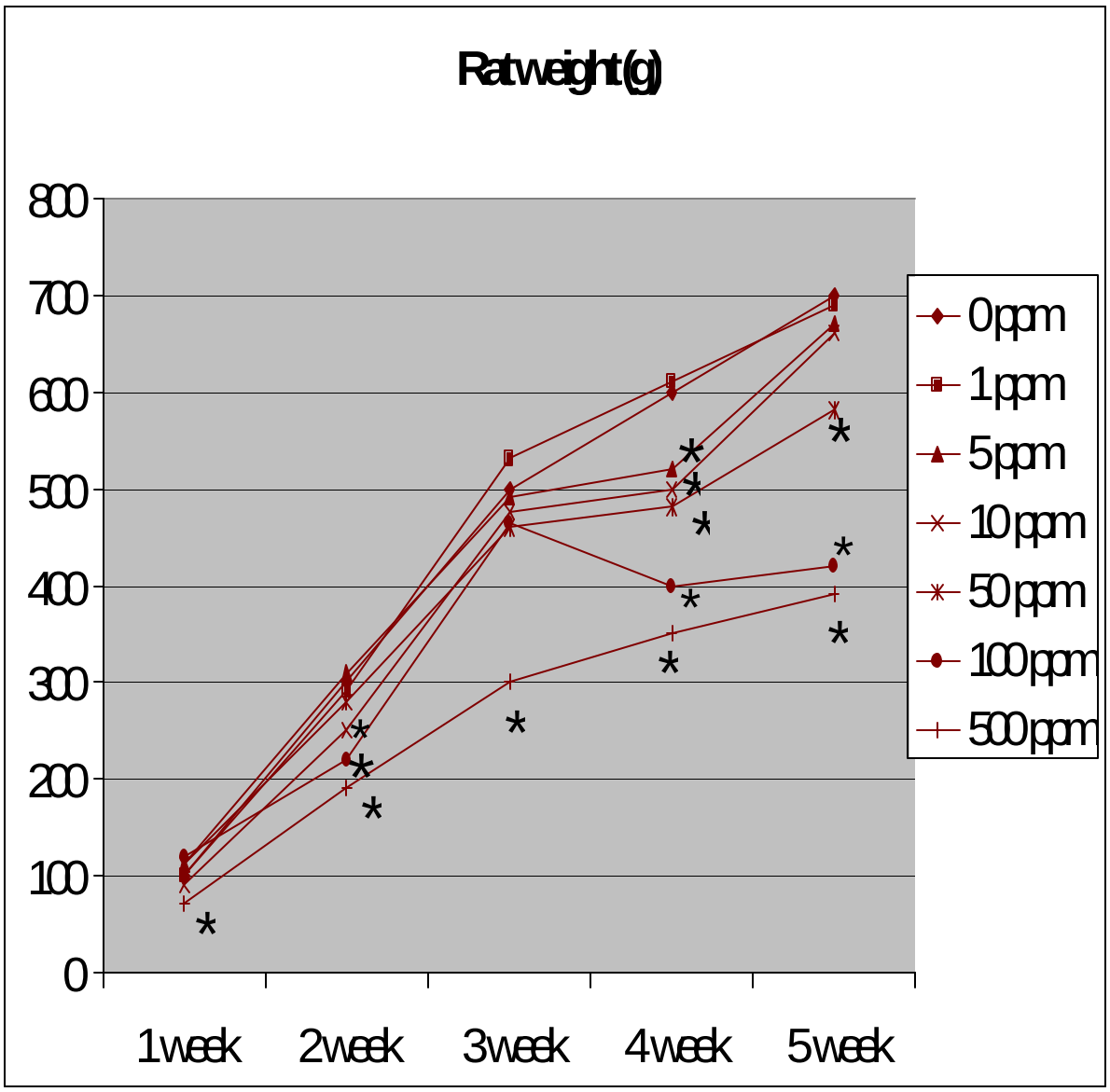
1. Calculated endpoints (e.g. LC50s, BAFs) are always coded separately.

2. Statistically analyzed graphed data that is graphed is coded as denoted in Example 1. Data trends should be examined (i.e. areas where the exposure changes from not significantly different to significantly different from the control values) and coded. The maximum number of result records that can be coded from statistically analyzed graphed data is 2n-1, where n is the number of concentrations including the control. If all data points for a single dose are significant, non-significant or have multiple significance (i.e. no clear response) combine all durations into

a single record (see Example 1, doses 2D, 4D and 7D). If a dose presents a clear trend (e.g. non-significant for the first three weeks and significant for the last two weeks) code two results for the dose. Combine the durations for the first three weeks and code the Statistical Significance as “nosig” for the first result and combine the durations for the second two weeks and code the Statistical Significance as “sig”. Code records similarly if part of the dose is significant or not significant and the other part has multiple significance (See Example 1, doses 3D, 5D and 6D.

3. For data that is not statistically analyzed, two lines are coded, one line for the control and a second line for all doses. For the ranged doses, the exposure number would be coded as #R (# representing the next dose level) and the exposure concentrations would be ranged in the Dose data field. See Example 2 for the coding of non-analyzed data.

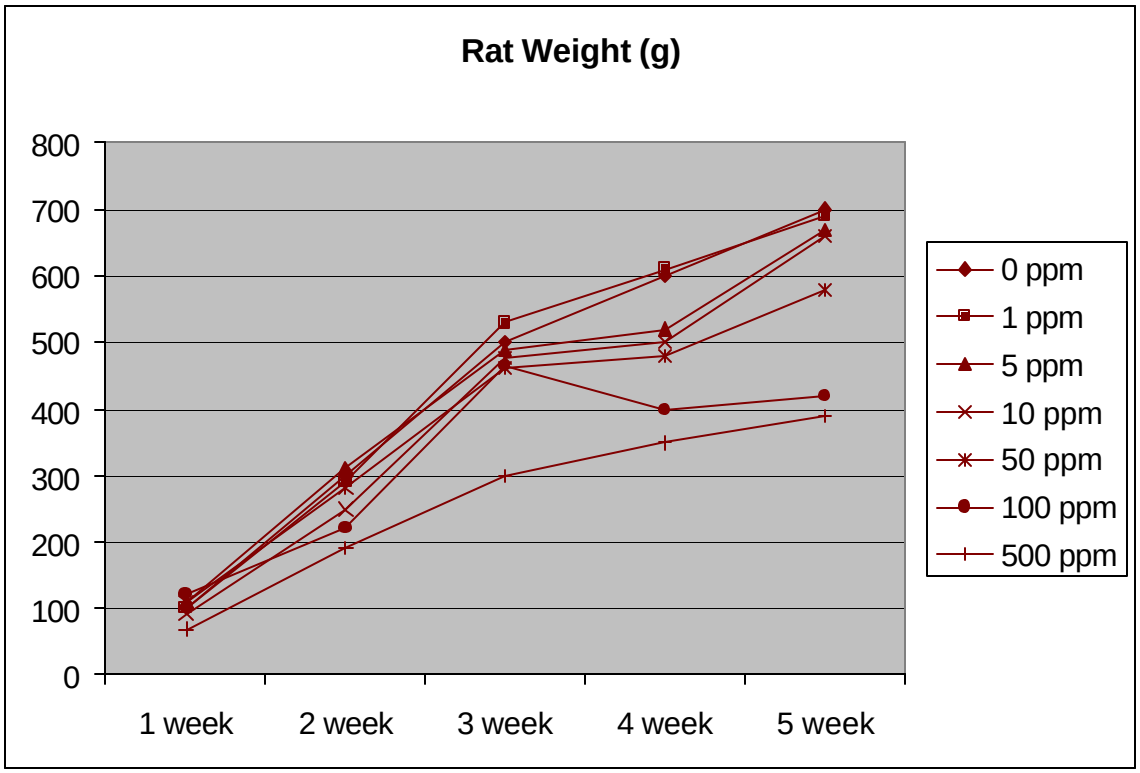
Example 1 Statistically Analyzed Data


Ratweight(g)
800
700
600
500
400
300
200
100
0
1week
2week
3week
4week
5week
0ppm
1ppm
5ppm
10ppm
50ppm
100ppm
500ppm

Terretox Results Coding for Example 1

ID	SMP # UNITS	OBSERV DUR	EFFECT	MEAS MENT	END PNT	R	STAT	LEVEL	P R	SITE	OBSERVED RESPONSE VALUE/UNIT					D W %	REMARK
											MEAN	RANGE	SM	VALUE	UNIT		
1C	NR OR	1-5 w	GRO	WGHT	NR	-1	NR	NR	P	WO	NR	~100/ - ~700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
2D	NR OR	1-5 w	GRO	WGHT	NR	-1	nosig	p<0.05	P	WO	NR	~100/ - ~700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
3D	NR OR	1-3 w	GRO	WGHT	NR	-1	nosig	p<0.05	P	WO	NR	>100/ - <500/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
3D	NR OR	4-5 w	GRO	WGHT	NR	-1	mult	P<0.05	P	WO	NR	>500/ - <700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
4D	NR OR	1-5 w	GRO	WGHT	NR	-1	mult	P<0.05	P	WO	NR	>0/ - <700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
5D	NR OR	1-3 w	GRO	WGHT	NR	-1	nosig	p<0.05	P	WO	NR	>100/ - <500/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
5D	NR OR	4-5 w	GRO	WGHT	NR	-1	sig	p<0.05	P	WO	NR	>400/ - <~700/	NR	NR	g	NR	1. RVALUE/F ROM GRAPH//
6D	NR OR	1-3 w	GRO	WGHT	NR	-1	mult	p<0.05	P	WO	NR	>100/ - <500/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
6D	NR OR	4-5 w	GRO	WGHT	N	-1	sig	p<0.05	P	WO	NR	~400/ - <~500/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
7D	NR OR	1-5 w	GRO	WGHT	NR	-1	sig	p<0.05	P	WO	NR	>0/ - <~400/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//

Example 2. Non-analyzed Data



Terretox Results Coding for Example 2

ID	SMP # UNITS	OBSERV DUR	EFFECT	MEAS MENT	END PNT	R	STAT	LEVEL	P R	SIT E	OBSERVED RESPONSE VALUE/UNIT					D W %	REMARK
											MEAN	RANGE	SM	VALUE	UNIT		
1C	NR OR	1-5 w	GRO	WGHT	NR	-1	NR	NR	P	WO	NR	~100/ - ~700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//
8R	NR OR	1-5 w	GRO	WGHT	NR	-1	NR	NR	P	WO	NR	~100/ - ~700/	NR	NR	g	NR	1. RVALUE/ FROM GRAPH//

Species Data

Data may be reported for an individual species as well as for a community or population. For example an author may report that biomass for an earthworm, Eisenia fetida, has decreased and that the invertebrate population biomass has increased. Report the measurements and endpoints as reported by the author for both the individual species and the species group.

Dose ID & Dose No

This is the same Dose ID and Number as recorded for each treatment level under the in Exposure Information. Transcribe the ID and Dose Number for each treatment level.

Sample Number (SMP#) and / Units

The sample number reflects the sample size (e.g., 10 embryos) that the observation or response value is based on at each exposure level. For endpoints based on calculations (e.g. LD50, NOEL, etc.) rather than individual dose measurements, the sample number will be coded as 'NR'. Code 'NR' if no information about the observed sample has been reported.

Sample units correspond to the sample number; i.e., the unit on which the measurement or endpoint is based (see Appendix Q for applicable codes). Code 'NR' if the sample unit is not reported.

EXAMPLE: For a sample size of 190 eggs, the sample unit is eggs (EG); therefore, if the effect measurement is HTCH, and the observation response value is 90%, then 90% of 190 eggs hatched.

Note: For generational studies and measurements based on the progeny, note F1, F2, etc. in the sample units field.

Note: If a sample number is not provided, but a "unit" is, always enter the unit in the sample units field.

Note: A FieldN test scenario involves exposing plots or sample areas, in addition to specific test organisms. Usually the number of exposed organisms is unknown. The number of plots or sample areas is coded as '#/EU' (the number of experimental units) in Results Information rather than in the Exposure Information Sample Number field. See Table 6 for coding examples

Observation Time Duration (OBSRV DUR)

The Observation Duration reported includes exposure time plus any additional days up to the time at which the response to the toxicant was observed. It does not include pre-treatment time. In the example in Table 4, the observation was made on day 11; therefore, the observation duration time is 9D. If the observation time is not reported or unable to be explicitly determined, code as less than

or equal to (<=) the exposure duration. NR should not be coded in this data field.

Observations during the pretreatment time are reported as negative values. For the Table 4 example, the observation time for a pretreatment sample collected on day 2 of the pretreatment period would be recorded as -1D. Report as '-x' any pretreatment response observations for which time is unknown.

In some cases a biological time is used, such as an observation time reported as "until hatch", "growing season" or "after the nth egg has been laid". Use the code from Appendix I that best describes the author's words in duration units data field. 'NA' will be coded as the duration mean value for all biological time durations (e.g. OBSERVATION MEAN: NA, OBSERVATION UNIT: HT; corresponds to an until hatch duration), unless a numeric value is substituted (e.g. OBSERVATION MEAN: 2, OBSERVATION DOSE: HV; corresponds to a 2 harvests duration). However, references to time such as "observed at end of the study period" are not coded; such papers are rejected as having no observation duration.

Note: In test scenarios where incubation times are reported, e.g.. enzyme fixation assays, be careful to report the toxicant exposure time *not* the assay incubation time.

Note: In test scenarios that involve generational studies, the observation duration times are reported from the time the parents were exposed. For example the parents were exposed for 10 months prior to mating, and the progeny was born 2 months later, the observation duration for both the adult REP PROG effect and for the juvenile DVP ABNL is 12 months. The exposure duration would be the same for both - 10 months. The only difference between the two effects is in the sample unit. The sample unit for the adult effect would be 'AD' and for the juveniles it would be 'F1'.

Table 6 . Results Information Coding Examples

Dose ID & No.	SMP # UNIT	OBS DUR	EFCT	MEAS	END PT	R	STAT	LVL	PR	SITE	OBSERV.RESP VALUE/UNIT X Range SM Value Unit	DW %	%LPD	RANK	RN	REMARKS
1C	10 F	5h	MOR	MDTH	NR	-1	NR	NR	NR	NR	11.5 SD 7.8 d	NR	NR	-	1	1 RVALUE/ from graph// 2 MSMT/ asymptotic level//
1C	" "	"	ACC	RSDE	"	-1	"	"	"	WO	1245 ug/g	W 25	42	-	2	
3V	" "	"	MOR	MDTH	"	-1	"	"	"	NR	15.8 SD 5.9 d	NR	NR	-	1	
4D	" "	"	"	"	"	-1	"	"	"	"	12.8 SD 7.6 d	"	"	-	1	
5D	" "	"	"	"	"	-1	"	"	"	"	15.6 SD 5.5 d	"	"	-	1	
5D	" "	"	ACC	RSDE	"	-1	"	"	"	WO	1459 ug/g	W 33	44	-	2	
6D	" "	"	MOR	MDTH	"	-1	"	"	"	NR	16.6 SD 8.0 d	NR	NR	-	1	
1C	10 EU	1-5d	REP	PROG	NR	-1	NR	NR	NR	NR	680 (645-690) eg/d	NR	NR	-	NR	
2C	"	"	"	"	"	-1	"	"	"	"	983 (825-1012) eg/d	"	"	-	NR	
3V	""	"	"	"	"	-1	"	"	"	"	259 (243-272) eg/d	"	"	-	NR	
4D	"	"	"	"	"	-1	SIG	<.05	P	"	246 (232-257) eg/d	"	"	-	NR	
5D	"	"	"	"	"	-1	"	"	"	"	255 (242-267) eg/d	"	"	-	NR	
	Data for REP/PROG would be continued for dose levels 3 and 5															
8E	NR NR	20d	MOR	MORT	LD50	-1	NR	NR	P	NR	9.8 (5.6 -11.2) d	NR	NR	-	1	

When coding the endpoints LTxx or ETxx, which are based on the time it takes to get a XX% response, code the associated effect response time and not the total exposure time in the OBSERVED DURATION field.

Example 1: A test with earthworms is run for 10 hours, but it takes 6 hours for the "T1/2" duration which is the time to take 50% to burrow. The author reported T1/2 endpoint is similar to an ET50 endpoint, therefore a reviewer assigned ET50 is coded.

Code: Assigned Endpoint: R Endpoint: ET50 Effect: BEH Measurement: BBBH Observation Duration: 6 h

Example 2: A 4 week study is run with quail and reports mortality. The author reports the LT50 value at 10 mg/kg, 20 mg/kg and 30 mg/kg as 3.5 weeks, 2 weeks and 1 week, respectively.

Code:

Assigned Endpoint: P Endpoint: LT50 Effect: MOR Measurement: MORT Duration: 3.5 wk

Concentration: 10 mg/kg

Assigned Endpoint: P Endpoint: LT50 Effect: MOR Measurement: MORT Duration: 2 wk
Concentration: 20 mg/kg

Assigned Endpoint: P Endpoint: LT50 Effect: MOR Measurement: MORT Duration: 1 wk

Concentration: 30 mg/kg

Effect

Ecotoxicology is the study of the “toxic effects of natural or artificial substances on living organisms (e.g. fish, birds, plants) ...” The effects may manifest at various levels of organization from sub-cellular through individual organisms to communities and ecosystems. Effects may be both positive and adverse; toxicology focuses on the adverse effects. Adverse effects include short-term and long-term lethality and sub-lethal effects such as changes in behavior, growth, development, reproduction, uptake and elimination, and tissue structure. (Rand 1995)

In TERRETOX, effect groups include accumulation, behavior, biochemistry, cellular, growth, mortality, physiology, population, reproduction and ecosystem (see Appendix R for definitions).

Within each effect group, the observed effect must be quantified in a reproducible way. In TERRETOX, two mechanisms are used to represent the observed effect: measurements and endpoints. Measurements include quantitative observations that describe and evaluate biological responses to toxicants, while endpoints are based on calculations derived from statistical analysis of the observations. Therefore, while measurements are direct biological observations, endpoints provide a statistical comparison of responses to toxicants. Coding criteria for each of these mechanisms is described below, directly following the General Notes section. The 'General Notes' section provides guidelines for extracting effect/ measurement data from the publication.

Effect Measurement (MEASMENT)

Generally, "measures" or "measurements" are variables used to aid in the interpretation of the degree of response to a toxicant by an organism. For example, measures of behavioral effects in TERRETOX include general behavioral changes (BEH GBHV), changes in feeding activity (FDB FDNG), and stimulus avoidance (AVO STIM). Appendix S lists the measurements currently used for each of the effects in the TERRETOX database. If more than one organism is measured in either an artificial (pot, cage, aquaria, etc.) or natural population (field, water body, etc.),reviewing staff will code the effect and measurement as POP BMAS (population biomass). For instances where there is an individual biomass (one organism, artificial or natural), reviewing staff will code GRO BMAS (growth biomass).

Endpoint/Result Set (R)/ Stat/Level/Assigned (PR) (ENDPT/STAT/Level/P or R)

Endpoint (ENDPT)

An endpoint is a value derived from statistical analysis or calculation of a specific measurement, or series of measurements, made during the test. Endpoints may be classified as measurement endpoints or assessment endpoints. Assessment endpoints refer to environmental parameters such as population, community or ecosystem measurements, e.g., growth rates or sustainable yields. Measurement endpoints refer to specific variables that are used to evaluate the assessment endpoints, such as diversity or evenness. (Hoffman et.al. 1995; US EPA 1996)

The ECOTOX databases utilize assessment and measurement endpoints which quantitatively represent the response(s) of a given individual, population, or community to the effects of a toxic agent. Appendix T lists and defines endpoints used in TERRETOX. For each endpoint, effect and measurement must also be coded. Refer to Table 6, Results Information, for coding examples.

For some endpoints, linkage to an exposure dose, and therefore an Exposure Dose Number, is

especially important. These endpoints include BAFs or time associated endpoints such as LTxx and ETxx and TKNO. However, endpoints that are not linked to a specific concentration, e.g., LDxx, are not associated with an exposure number because the observed result is based on a calculated rather than an observed dose. These endpoints are linked with a placeholding Dose ID and Dose Number. The linkage is noted by E in the DOSE ID data field and the associated DOSE NO. in the EXPOSURE information. Refer to Table 5, Results Information, for coding examples.

In contrast, NOEC/NOELs and LOEC/LOELs are the endpoints used to represent a statistically significant range within the tested concentrations. The NOEC/NOEL is the highest tested concentration having no statistically significant adverse effect and the LOEC/LOEL is the lowest tested concentration having a statistically significant adverse effect. (Rand 1995) NOEC/NOELs and LOEC/LOELs are also linked by the place holding exposure number, as indicated in the previous paragraph.

For endpoints of ETXX or LTXX, code both the observation duration and the observed response value with the same values.

Result Set (R)

This field is used to link effects and endpoints together for data output display. The default entry for this field is -1. Enter positive integers for each specific effect/endpoint linkage. For example, a mortality data table and an LD50 as well as a body weight growth table and an EC50 are reported. Code all of the mortality data table and the LD50 with a '1' in the R data field and code '2' in the R data field for the growth and EC50 data. If there are endpoints without data or vice versa, code '-1' in the R data field. See Table 6, for examples.

Significance (STAT)

The significance or STAT data field is coded with SIG or NOSIG if the author has presented statistical analysis of the test result as compared to the controls. As a general rule, if statistics are presented in the publication, assume that the exposure treatments were compared to the control. Statistical tests that measure differences between treatments are not coded. See Tables 7 and 8 for coding examples.

When statistical comparisons are presented for multiple controls (e.g., statistics in relation to a standard and solvent control), both sets of results are coded. In these instances, note the specific type of control used in the statistical analysis in the Remarks section.

The STAT data field is coded as "NR" for records having an endpoint of LCxx, ECxx, LTxx, BAF, ETxx, ICxx, LDxx. For NOEC/NOEL, LOEC/LOEL and statistically analyzed effects results without endpoints, code the significance as reported by the author(s), or 'NR' if statistical results are not presented in the publication.

If the author states that there is a 'statistically significant' increase or decrease in an observed effect (whether or not they report the statistical method used) but does not report a level of statistical significance level or identify a method of statistical analysis, code 'SIG' or 'NOSIG' and 'NR' in LEVEL field. If the author states there is a significant increase or decrease in an observed effect but does not say it is "statistically significant," code 'NR' in the STAT data field.

Note: For concurrent control results, there is no STAT or LEVEL defined. Statistical significance is compared to the control values.

Note: Coding statistics from least square differences (LSD).

If a paper presents data in the following format, determine the statistical significance by the following calculation.

Dose	Response
Control 1	2.4
Dose 2	4.6
Dose 3	4.8
Dose 4	6.7
LSD(0.05)	1.1

Subtract or add the LSD value (1.1) to the control value to get the lowest value that is significantly different. In this example, anything above 3.5 or below 1.3 is a significant value at the p=0.05 level. Therefore, all doses are significantly different from the control because they are all greater than 3.5 (Pers. Comm., R. Regal, UMD Statistics Dept., 1999).

Level

The level of significance (e.g. test statistic) is coded when the author has reported statistical analysis in the test result. Terminology for significance level may be presented as: p =; p< or alpha value; χ^2. The terminology is equivalent and is generally in the range of 0.001 to 0.10. See Tables 7 & 8 for coding examples.

The LEVEL data field is coded as reported by the author. If endpoints of LCxx, ECxx, LTxx, BAF, ETxx, ICxx, Ldxx report confidence intervals/limits, etc., report the significance level in the LEVEL field, e.g., 95% CI is coded as 0.05.

Paper/Reviewer Assigned Data (P or R)

The PR data field is used to identify the source of the effect or endpoint information. If the effect or endpoint was reported by the author in the publication a 'P' is coded in the PR data field; if the effect or endpoint was assigned by the reviewer, an 'R' is coded. See Tables 7 & 8 for coding examples. Endpoints calculated by the author must be specifically identified, i.e., LD50, LT50 or NOEL/NOEC (see Appendix T for endpoint codes and definitions).

Reviewers will follow these guidelines in *assigning* endpoints:

1. BY DEFINITION: If the author does not actually state that the value is an LD50 but states that "concentration x is the dose estimated to be lethal to 50% of the test organisms", the reviewer should code this as an LD50 endpoint because the author *defines* the LD50. Such a designation is accompanied by noting 'R' in the PR data field.

2. When the author provides text which identifies a value as the "highest tested concentration having no statistically significant adverse effect", the reviewer should code this as a NOEL/NOEC ; the "lowest tested concentration having a statistically significant adverse effect" is coded as a LOEL/LOEC . In both cases, the PR field will be coded as 'R' to reflect reviewer assignment of an endpoint. Because LOEL/NOEL values are assigned under very specific experimental and statistical conditions, TERRETOX reviewers will be assigning complementary NOELs or LOELs only when the author assigns either a LOEL or NOEL.

3. When the author provides statistical information, which designates concentrations as significantly different from the control, the reviewer will code this information as SIG or NOSIG. The reviewer will also report the level of significance in the LEVEL data p-value in the p-value field.

Table 7. Coding Statistical and Endpoint Data Directly from a Table.

"The data from our experiments is shown in the following table."

#	Conc ug/g	Survival %	Stat sig p<0.05	Calc Endpt
C1	0	97	NR	NR
D2	7	97	NOSIG	NR
D3	15	75	NOSIG	NOEL
D4	30	26	SIG	LOEL
D5	50	0	SIG	NR

In this example, the raw data table is coded as follows:

DOSE	EFFECT	MEASMENT	ENDPT	R	STAT	LEVEL	P R
C1	MOR	SURV	NR	1	NR	NR	P
D2	MOR	SURV	NR	1	NOSIG	p<0.05	P
D3	MOR	SURV	NR	1	NOSIG	p<0.05	P
D4	MOR	SURV	NR	1	SIG	p<0.05	P
D5	MOR	SURV	NR	1	SIG	p<0.05	P
E6	MOR	SURV	NOEL	1	NOSIG	p<0.05	P
E6	MOR	SURV	LOEL	1	SIG	p<0.05	P

Table 8 . Coding Statistical Data Directly from a Table with a Reviewer Assigned Endpoint.

"The data from our experiments, in Table Z, shows that the concentration that had no observable effect on mortality was 7 ug/g."

Table Z: Mortality of *Eisenia fetida* to copper

#	Conc ug/g	Survival %
C1	0	97
D2	7	97
D3	15	75
D4	30	26
D5	50	0

In this example, the table is coded as follows:

DOSE	EFFECT	MEASMENT	ENDPT	R	STAT	LEVEL	P R
C1	MOR	SURV	NR	1	NR	NR	P
D2	MOR	SURV	NR	1	NR	NR	P
D3	MOR	SURV	NR	1	NR	NR	P
D4	MOR	SURV	NR	1	NR	NR	P
D5	MOR	SURV	NR	1	NR	NR	P
E6	MOR	SURV	NOEL	1	NOSIG	NR	R
E6	MOR	SURV	LOEL	1	SIG	NR	R

Standard methods recommend that when determining a NOEL/LOEL, at least three exposure concentrations be used (Menzer 1994 at 1406);. If the *author* uses only one exposure concentration AND assigns a NOEL/LOEL or SIG/NOSIG result, a Remark noting "only conc tested" will be coded.

Response Site (SITE)

The specific site at which an effect measurement was observed is coded in the SITE data field, e.g. for residues (RSDE) recorded in the "liver," enter 'LI' in the SITE data field (see Appendix U for applicable codes). Response site is valid entry for GRO, AEG, CEL, PHY, DVP, GEN, REP, HIS, ENZ, BCM, HRM, INJ, MPH and ACC effect groups (see Appendix S for effect group and measurement codes). If a response site is not reported or not applicable, e.g. mortality, behavioral effects, code the site as Not Reported (NR).

If data are presented without statistical analysis in a graph or figure, results for each measurement are combined by response site.

Observed Response Value/Unit: , Mean, Range, Statistical Method (SM), Value, Unit (Mean, Range, SM, Value, Unit)

Enter the greater than (>), less than (<), minus (-) or approximation (~)symbols, if reported, as used by the author(s) to describe the response value preceding the MEAN or RANGE data field entries.

Report the mean or single observed response value, as reported in the publication, in the MEAN data field. When individual response values are reported along with a sum of all values, report each individual response value as well as the sum/total value on separate result lines.

Report the range or confidence (or fiducial) intervals (or limits) of the response value in the RANGE data field. The type of data stored in the RANGE data field will be identified in the SM data field (e.g., Data reported as a range (with a mean) or confidence interval (with an endpoint) will be

specifically identified in the SM field. It is also assumed that the confidence interval is calculated at 95% and is noted in the LEVEL data field.

When the measurement unit includes a standard deviation (SD) or standard error (SE), specifically identify these types of ranges in the SM data field. Report the numeric value of the standard deviation or standard error in the VALUE data field.

Report the measurement unit which corresponds to the MEAN and/or RANGE entry in the UNIT data field (see Appendix N for standard units).

Refer to Table 6 in Results Information for coded examples. Table 6a. provides a standard deviation example, Table 6b. provides an example of a range, and Table 6c. provides a confidence interval example.

Dry or Wet Weight (DW%)

Record whether the residue/bioconcentration/bioaccumulation or growth data are reported on a dry or wet weight basis in the DW% data field. If percent moisture is reported, record the percentage value also, e.g. W75%.

Percent Lipid (%LPD)

If percent lipid information is provided in the publication, record as a % value in the %LPD data field. If the data are not reported in the publication, code as 'NR'.

Rank (RANK)

Following evaluation by EcoSSL (Ecological Soil Screening Levels) Task Group reviewers, this field will be marked for each test result for each publication to indicate the Evaluation Criteria Score and selected benchmark value ranking for determining the EcoSSL value. Prior to this, leave this data field blank.

Remark Number/Remarks (RN/REMARKS)

When there are remarks for a specific test, the REMARKS field as well as the Remark Number (RN) field, will be used. The Remark Number field is used to link the remarks associated with each specific test result. Each unique Remark is assigned a Remarks Number and only one Remark Number is used per result entry. Use a unique Remark Number for each section of the database, i.e., do not carry over Remarks or Remark Numbers from the Exposure Information to the Results

Information sections. Remarks are preceded by the Remarks Number and identified by the field abbreviation listed in Appendix EE. Refer to Table 6 for coding examples.

General Coding Information

Q. What is encoded from a publication?
A. All quantitative data are encoded from the publication. Each data point from tables, text and graphs is coded. Graphical data may be coded as ranges (1 result for the control and 1 result for all of the doses), unless statistical analysis is performed. Graphed data is reported by using <, > or ~ values. These values must be the values noted by the axis marks from the graph. If duplicate results are reported in text and tabular format, note in the margin of the paper that the text information was coded from Table N. Non-quantitative data are noted in the general remarks section.

Q. Are abstractors allowed to interpret results from publications?
A. All information from a paper is abstracted using the author's terminology and numeric values. Exceptions to this include the expansion of exponential numbers and when the author's "words" match the standard definition effects and endpoints. If an endpoint is "interpreted" by an abstractor, it is noted by an 'R' in the ASSIGNED P/R data field.

Q. How and why are comments made?
A. In general, comments are used to better define or capture the researcher's intent. THESE ARE USED SPARINGLY. Comments are linked to coded fields by an identifier in the appropriate comments field (Organism, Exposure, Soil, General or Results information/remarks data fields). For example, a RESPONSE VALUE comment of median LC50 is located in Result remarks data field as Rvalue/median LC50//. Some comments are not linked to a specific data field (i.e. exposure temperature or in vitro studies). These comments are also noted in the appropriate comments field (i.e. exposure temperature in Exposure information and in vitro in the general remarks data fields).

Q. Is anything written in the original paper by the data abstractors?
A. Abstractors should note any comments about abstraction in the margins or on the tables/graphs of the original paper. This would include the Test ID Number for each unique test design, reason for data not being coded, LD50s outside of confidence intervals, errors between text and tables, or other anomalies.

Q. What happens if an endpoint is outside the confidence interval/limit or text and tabular or text and abstract data points differ?
A. The abstractor encodes only the endpoint value and notes that the range was not coded in the original publication. Textual information is used over all other data, unless the value is noted in another section of the paper. Then, the most frequent value is encoded.

6. Supporting Materials

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TERRETOX CODING SHEET (FEBRUARY 14, 1999) TID _____

CHEMICAL | GRADE | PURITY | FORMULATION | CHARACTERISTICS | RADIO LABEL | CAS NUMBER

1. TEST _____
2. POSITIVE CONTROL/CARRIER _____
3. POSITIVE CONTROL/CARRIER _____

REFERENCE #, AUTHOR, YEAR _____ TOTAL TESTS _____ Reviewer _____ Review Date ___/___/___ QA DATE ___/___/___ INITIALS _____

TEST INFORMATION

EXPOSURE INFORMATION

SPECIES LATIN/COMMON NAME _____

SPECIES NUMBER	
ORGANISM SOURCE	
LIFESTAGE / AGE	
ORGANISM CHARACTERISTICS	
TEST LOCATION	
EXPOSURE TYPE	
EXPOSURE DURATION	
STUDY DURATION	
CONTROL TYPE	
DOSE NUMBER	
APPLICATION FREQUENCY	
MEDIA TYPE	
SOIL TYPE	
SOIL TEXTURE	SA _____ % SI _____ % CL _____ %
MEDIA PH	
MEDIA ORGANIC MATTER	
MEDIA MOISTURE (%)	
MEDIA CEC	
SOIL CONC MEASURED (Y/N)/ DRY - WET WEIGHT	

REMARKS

SPECIES INFO

EXPOSURE INFO

SOIL INFO

DOSE	DOSE_ID	N	SEX	DOSE	SM	VALUE	UNIT	ION	M/U	RN

GENERAL REMARKS

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RESULTS INFORMATION

_____ REFERENCE NUMBER _____ CAS # _____ TID _____

LOC #	DOSE NO/ID	SMP # UNITS	OBSRV DUR	EFFECT	MEASUREMENT	END POINT	R	SIG/NSIG	LEVEL	PR	SITE	OBSERVED RESPONSE VALUE/UNIT					DW %	%LPD	RANK	RN	REMARKS
												MEAN	RANGE		SM	VALUE	UNITS				
1 -													-								
													-								
3 -													-								
													-								
5 -													-								
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7													-								
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11													-								
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